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(71) Applicant: **Kuitenbrouwer, Tibor Benediktus Stanislas Sebastiaan**
**2623 CR Delft (NL)**

(72) Inventor: **Kuitenbrouwer, Tibor Benediktus Stanislas Sebastiaan**
**2623 CR Delft (NL)**

## (54) System enabling transfer of mileage and other vehicle data as registered, processed and stored by the system, to telecommunications and data networks outside the vehicle

(57) System to be used in wheeled vehicles, for registration, processing and storage of data with respect to trips of the vehicle, comprising means for data transfer between the system according to the present invention and suitable electronic devices in said vehicle or in the proximity of said vehicle, characterised by the fact that the system according to the present invention comprises means to control at least one other electronic device in such manner that through said electronic device, trip data as registered, processed and stored by the system according to the present invention, is transferred to one or more telecommunications and/or datanetworks outside the vehicle.

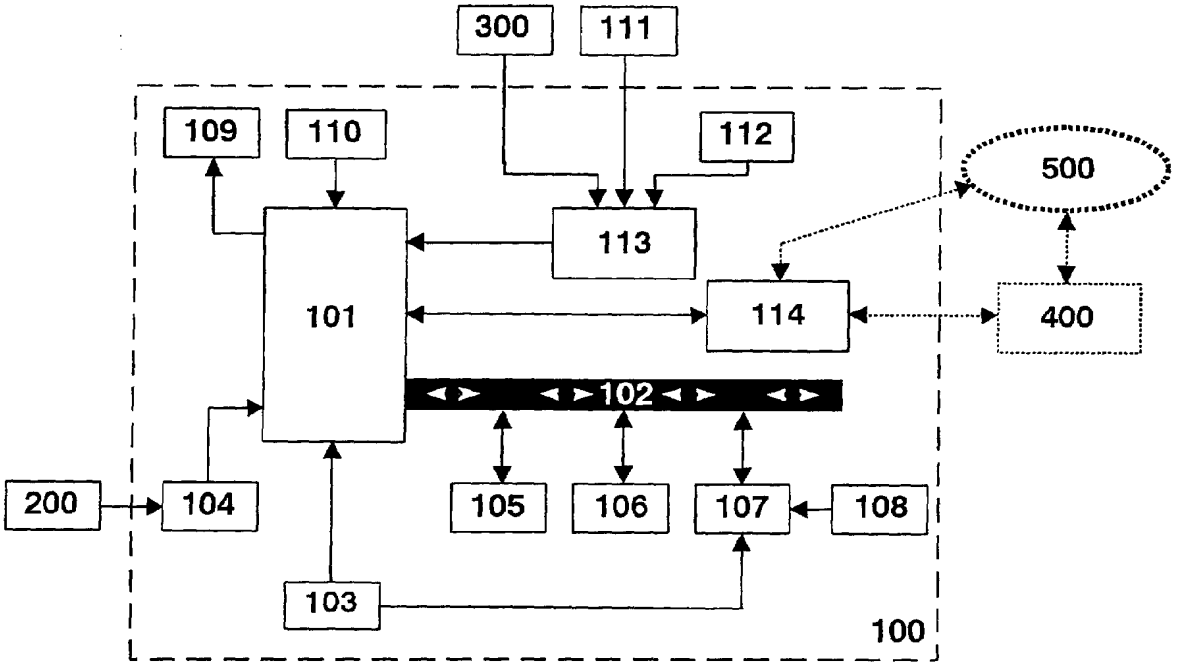



Fig. 1

EP 1 207 499 A2

## Description

FIELD OF THE INVENTION

**[0001]** The present invention generally relates to a system to be used in wheeled vehicles, enabling registration, processing and transfer to at least one telecommunications or datanetwork outside the vehicle, of data with respect to a trip of the vehicle, like for instance a trip number, date and time at the start of a trip, date and time at the end of a trip, the odometer reading at the start and at the end of a trip, and an identification of the purpose of the trip, for instance private, business or commuting.

BACKGROUND OF THE INVENTION

**[0002]** Traditionally in motorcars and other (motor)vehicles there's a device present to register the distance traveled by the vehicle. Even today the principle of many of these "odometers" is based on a mechanical conversion of wheel or axle rotation into a measure of the distance traveled, which measure is displayed through a mechanical or electronic counter in the vehicle's dashboard. In addition to registration of the total distance traveled by the vehicle since it was manufactured, many odometers offer a possibility to register the distance traveled by the vehicle during a specific trip, through the use of a so-called "daycounter", which can be reset to zero prior to every trip. In the above mentioned conversion of wheel or axle rotations into mileage information, the conversion error may be as large as five percent.

**[0003]** Presently registration of the distance traveled by a vehicle is predominantly achieved through the use of electro-mechanical sensors, with the aim to facilitate processing of the resulting data in electronic form by the measurement and control electronics that take an increasingly important position in modern road vehicles. The wheel or axle rotations are in this case represented by electrical pulses, where the number of pulses in a specific period of time is related to the distance traveled by the vehicle during that period of time. In this respect it is to be noted that the relation between the number of pulses per period and the distance traveled by the vehicle during that same period is dependent on vehicle parameters like the wheel diameter.

**[0004]** An accurate registration of the distance traveled by a vehicle is important in many respects. Some of the more traditional situations where this registration plays a role include for instance determining the market value of a vehicle that is to be purchased or sold, determining when vehicle maintenance is required, determining the rent when one has rented a vehicle, calculating the height of the allowance to be paid by an employer to an employee when the latter uses his/her private vehicle for business purposes, calculating the fare for a taxi trip, or registering the fuel consumption of a vehicle per unit distance.

**[0005]** Nowadays the economic importance of (car) mobility is very high. In addition to this many corporate motor pools consist completely of leased vehicles, leading to a situation in which leasing companies are the legal owners of the vehicles and are in most cases also responsible for vehicle maintenance. However, current information with respect to the leased vehicles is not continuously at the disposal of said leasing companies, like for instance the odometer reading, that may be important to determine for instance whether maintance is required, or to determine whether the lease contract should be revised because the distance traveled with a specific vehicle significantly exceeds the contract provisions. Cars in the higher priced segments are in some cases equipped with extensive sensor and control systems, for instance offering the possibility to send a telecomunications message to the maintenance service with respect to (potential) defects in the vehicle's technical systems. Such equipment is however quite expensive, what makes application economically infeasible for average corporate motor pools. In addition to this comes the fact that such equipment is in most cases specifically tailored to a particular brand or even a particular type of car. This makes flexible application of said equipment in vehicles of different brand and/or type virtually impossible.

**[0006]** The patent document US 5 673 018 describes a relatively simple passive transponder device that is to be affixed to a vehicle wheel. By means of a sensor the wheel rotations are registered and converted into a measure of the distance traveled by the vehicle. This mileage data is stored in an electronic memory in the device. When the transponder comes into the range of the electro-magnetic field of a special transmitter/receiver which is located for instance at the entrance of a garage or a fuel station, the transponder emits a signal, for instance consisting of an electronic representation of said mileage data, which is then received by said receiver. The main disadvantage of this device is the fact that the mileage data can only be transferred to systems outside the vehicle at specific locations. In addition to this, the affixing of electronics to moving parts of the vehicle's exterior, in this case a wheel, considerably increases the risk of damage to the device which may result in defects.

**[0007]** Furthermore, devices are known in the art, that enable the transfer of vehicle data by means of infrared light to receivers outside the vehicle. Also in this case, data can only be transferred at specific locations, and there is a need for a clear line of sight between the transmitter inside the vehicle and the receiver outside.

**[0008]** Registration of the distance traveled with a vehicle furthermore plays an important role when a distinction has to be made between distance travelled for private purposes and distance travelled for business purposes. For most companies with a motor pool that mainly consists of leased vehicles this will be the case. In some countries people who drive a "company car" that

is leased by their employer will be subjected to the payment of extra income taxes when the distance travelled with the company car for private purposes exceeds a specific treshold value. To avoid extra taxation the registered user of the leased vehicle is required to keep a consistent and accurate mileage record. It is also required that there exits an unambiguous relationship between mileage registered as being for business purposes and a specific business activity. To be able to prove such relationship an accurate activity record has to be kept. Manually keeping such mileage and activity records, for instance by reading the vehicle's odometer at the start and end of every trip, calculating the distance travelled during said trip and writing it down together with the corresponding business activity, may easily lead to errors, omissions and unnecessary costs.

**[0009]** In the past, numerous systems have been developped to remedy the problems mentioned above by automating said mileage registration as well as said activity registration. In the patent document US 5 541 858 a device is disclosed consisting of a portable unit comprising at least a micro-processor, RAM-memory, a display and a keyboard, that can be placed in a docking-station in the vehicle. The device makes use of the electronic odometer signal that is standard available in most recent model road vehicles. In addition to this, the device offers the possibility to a user to register activities by assigning a numerical code to each of the activities. The record of an activity, for instance a visit to a specific client, may then be logically connected to a vehicle trip record by entering the corresponding numerical code, after which the data is stored in the portable unit. On the portable unit there's an electrical connector present, through which the registered data can be transferred at a later stage to for instance a personal computer for further processing.

**[0010]** The patent document US 6 064 929 discloses a device wherein the above mentioned portable unit is a portable personal computer (notebook computer, laptop computer), equipped with software for keeping an extensive activity record. The odometer signal that is available in the vehicle is lead to the computer by means of a cable and is combined in said computer with a time and activity record.

**[0011]** A significant drawback of the latter two devices known in the art, is that said portable unit as well as said personal computer are in fact assigned to a specific user and not to a specific vehicle. It is the personal responsibility of this user to transport the device from the vehicle to, for instance, an office location where the stored information can be read out of the device and entered into, for instance, the company's accounting system. The electronic odometer signal however, is dependent on vehicle specific parameters like for instance the wheel diameter. Consequently, when the above mentioned systems are used in another vehicle than the vehicle used for the previous registration, the distance measurement needs to be calibrated before the first trip in this new vehicle. In most cases such calibration requires reading the odometer and entering the resulting data into the device at least twice, which may lead to errors and omissions. Another drawback of the registration of odometer readings with the help of a portable personal unit, like a portable computer, is the fact that if a vehicle is used by a second person between two trips of a first person, and this second person does not use the same portable unit, the mileage record will not be consistent anymore. The most recent odometer reading stored in the portable unit of the first person will in this case differ from the current odometer reading in the vehicle. Preceding a next registration with said first portable computer, a user will then have to enter again the current odometer reading into the device, with the aforementioned drawbacks as a potential consequence.

**[0012]** The system according to the present invention means to remedy the drawbacks of devices known in the art in this field. To this effect a system for use in wheeled vehicles will be proposed, enabling registration, processing and storing data with respect to trips of said vehicle. The system comprises means for the transfer of data between said system and suitable other electronic devices in the vehicle and/or in the proximity of the vehicle. Said other electronic devices may include for instance mobile cellular telephones en portable computers (like laptop computers, notebook computers, palmtop computers, personal digital assistants) which can nowadays be regarded as more or less belonging to the standard equipment of professional users of wheeled vehicles, and will, as such, be present in said vehicles at least during normal business hours.

**[0013]** The system according to the present invention is characterised by the fact that it comprises means to control said electronic devices in the vehicle or in the proximity of the vehicle in such a fashion that through said electronic devices, data with respect to trips of said vehicle, as registered, processed and stored by the system according to the present invention, can be transferred to at least one telecommunications and/or datanetwork outside the vehicle.

**[0014]** In this way a user has a high degree of freedom in selecting a telecommunications and/or datanetwork through which the data transfer will take place, for instance a GSM (Global System for Mobile communication)-network, satelite networks, networks similar to the Dutch Traxys-network or the future UMTS (Universal Mobile Telecommunications System)-network, as well as a high degree of freedom in selecting a format according to which the communication will take place, for instance in the form of S.M.S. (Short Message Service)-messages, email-messages or facsimile-messages. A significant advantage of the use of such networks is the fact that a vehicle does not have to be at a specific location to be able to transfer the trip data stored in the system according to the invention. Electronic devices like mobile cellular telephones and portable computers are commonly available and relatively low-priced. For

said transfer of data between the system according to the present invention and said electronic devices in or in the proximity of the vehicle, the system according to the present invention may employ a range of communications standards like IrDA (Infrared Data Association) for communication by way of infrared light and Bluetooth for short-distance radio communications. These communications standards are widely supported by manufacturers of, for instance, mobile cellular telephones and portable computers.

**[0015]** Systems like said portable computers offer flexible possibilities for further on-site processing of trip data, for the addition of extra information and for example for making hard-copies of data by means of a printer in the vehicle itself.

**[0016]** The system according to the present invention may itself comprise means for direct transfer of data as registered, processed and stored by said system according to the present invention to at least one telecommunications and/or datanetwork outside the vehicle. For this purpose the system according to the present invention may for instance comprise built-in transmission/reception means for the GSM-network. This embodiment of the system according to the present invention is particularly advantageous in case only very limited interaction between the system according to the present invention and a user of the vehicle is necessary or required. This may for instance be the case when the functionality of the system according to the present invention is limited to the periodic transfer of trip data to for instance the manager of the corporate motor pool or to a maintanance service. Access to said means for transfer of data between the system according to the present invention and said electronic devices in or in the proximity of the vehicle may then for instance be restricted to an authorised maintenance employee for entering or correction of vehicle specific data in the system according to the present invention. To perform said entering or correction of said vehicle specific data for instance a remote control device using infrared light could be used.

**[0017]** Trip data as registered, processed and stored by the system according to the present invention at least comprise a trip number, date and time at the start of a trip, date and time at the end of a trip, the odometer reading at the start and at the end of a trip, and an identification of the purpose of the trip. The purpose of the trip may be for instance private, business or commuting.

**[0018]** Through an electronic device in the vehicle or in the proximity of the vehicle, which is suitable and comprises means for the transfer of data between the system according to the present invention and said electronic device, extra information may be added. Said extra information may for instance comprise information pertaining to the business activity related to the specific vehicle trip, for instance a visit to a specific client. Such extra information can be added by means of for instance a portable computer (like a laptop computer, notebook computer, palmtop computer, personal digital assistant etc.). In this way a consistent combination of mileage registration and activity registration can be achieved, which may lead to reduced taxation. Furthermore said extra information may comprise the vehicle location at the start and at the end of the trip, which information could be provided by for instance a G.P.S. (Global Positioning System)-system in the vehicle. Said vehicle location could also be determined by detecting automatically, for instance by means of a mobile cellular telephone, in which cell of a cellular network for mobile communications the vehicle is located and by using the known geographical location of said cell as an approximation for the location of said vehicle. In addition to this extra information could be added in the form of an electronic representation of speech. For this purpose one could make use of a vehicle's built-in microphone/speaker system for a mobile telephone or a microphone/headphone set, which are commonly used nowadays. In this way the system according to the present invention offers flexible and relatively simple usage for a wide range of applications.

**[0019]** To provide for a base functionality, the system according to the present invention comprises at least the following parts:

- a central control and processing unit, for instance a microprocessor, equipped with a suitable software program to provide for the right functionality.
- an electronic memory for storage of vehicle specific data like for instance a vehicle identification code and data necessary for calibration of the vehicle's electronic odometer signal.
- an electronic memory for storage of trip data as registered and processed by the system according to the present invention.
- electronic means to provide the accurate date and time to the system according to the present invention.
- means to detect whether the vehicle's ignition switch is being operated.
- means to register the vehicle's electronic odometer signal.
- means to connect a cable for datacommunication with electronic devices outside the system according to the invention.
- output means, suitable for issuing an optical and/or acoustical warning to a user of the system according to the invention.

**[0020]** All of the abovementioned parts may be realised by means of commonly available and relatively low-priced components.

**[0021]** Said electronic odometer signal may be easily obtained from a standardised connector which is present in most recent model road vehicles to connect for instance a car radio. By using said electronic odometer signal instead of signals provided by complex electronic control and processing systems that may be

present in the vehicle, only relatively simple vehicle parameters like for instance the wheel diameter have to be taken into account. This has the advantage that the system according to the present invention can be built-in and calibrated in a relatively simple manner.

**[0022]** By using said standardised connector, one can furthermore detect in a simple way whether the vehicle's ignition switch is being operated, by detecting significant changes in the electric voltage on the supply lead in said connector.

**[0023]** Said output means, suitable for issuing an optical and/or acoustical warning to a user of the system according to the invention, preferably issues a warning to a user, when the available memory capacity for storing trip data has decreased below a specific treshold value. The latter situation may occur when, due to for instance a defect in an electronic device in the vehicle or in the vehicle's proximity, data transfer to a telecommunications or datanetwork outside the vehicle can not take place for a certain period of time. It is evident that said memory capacity treshold value needs to be chosen so as to provide a user of the system according to the present invention under normal usage conditions with sufficient time to seek technical assistance and support before trip data is lost.

**[0024]** It is advantageous to realise the system according to the present invention in such a way that the system periodically derives data from the aforementioned electronic odometer signal, with respect to the distance travelled by the vehicle per unit time, and stores this data in an electronic memory in the system according to the present invention. In the case that said data with respect to the distance travelled by the vehicle per unit time is stored in the system according to the present invention, and the storage capacity of said electronic memory is sufficiently large, so that at every point in time distance data with respect to a fixed period of time preceding said point in time is present in said electronic memory, the system according to the present invention can function as an accident recorder, more or less similar to a flight data recorder, sometimes referred to as "black box", in airplanes. For at any point in time the system according to the present invention contains a record of the distance travelled by the vehicle per unit time, registered over a certain period of time preceding said point in time. If said unit time is chosen in the order of one second, the registered distance traveled per unit time is a reasonably accurate measure of the vehicle speed. For instance when the vehicle has been involved in an accident, such data may provide valuable information with respect to the cause and course of the accident, like details concerning the vehicle's acceleration and deceleration.

**[0025]** The aforementioned electronic memory for storage of vehicle specific data in the system according to the present invention, may for instance contain data necessary for calibration of the vehicle's electronic odometer signal. The contents of this memory is of primary importance for a correct functioning of the system according to the present invention, and it may therefore be advantageous to secure said memory by means of data encryption, so that said vehicle specific data can only be entered, read out and altered by an authorised person.

**[0026]** It is furthermore advantageous when the system according to the present invention comprises input means enabling a user to indicate if a trip is to be registered as business, private or commuting. A simple embodiment of said input means could be a three-position switch.

**[0027]** The system according to the invention may comprise means to detect whether the filling opening of the vehicle's fuel tank is open or closed. The open or closed status of said filling opening may serve as an indication of the instances when the vehicle is fueled. Such registration of fueling sessions could provide a basis for keeping a fuel administration. Such fuel administration is often kept in addition to the aforementioned mileage and activity records. In many cases leasing companies offer so-called fuel arrangements with leased vehicles. according to such arrangements a chipcard may be issued to the user of a leased vehicle which can be used to pay for fuel at for instance a fueling station. Said registration of the open or closed status of the filling opening of the vehicle's fuel tank may then be used to establish an administrative relation between a fueling session of a specific vehicle and fuel payments with the use of said chipcard.

**[0028]** The system according to the present invention preferably comprises means for the transfer of data by way of infrared light, between the system according to the present invention and electronic devices in the vehicle and/or in the proximity of the vehicle. To achieve this, a transmitter/receiver for infrared light can be placed at a suitable location in the vehicle's interior. Many electronic devices like mobile cellular telephones and portable computers (like laptop computers, notebook computers, palmtop computers, personal digital assistants), which can nowadays be regarded as more or less standard equipment of professional users of wheeled vehicles, are already equipped with means for datacommunication by way of infrared light. A further advantage of this could be that the aforementioned vehicle specific data, stored in the system according to the present invention, could simply be entered or corrected with a remote control using infrared light by for instance a maintenance employee. In most cases it would not even be necessary for said maintance employee to enter the vehicle's interior.

**[0029]** The aforementioned means of the system according to the present invention for datacommunication by way of infrared light could advantageously be organised to adhere to the so-called "IrDA" (Infrared Data Association) communications standard. Electronic devices in the vehicle or in the proximity of the vehicle that are to be used in combination with the system according to

the present invention, like mobile cellular telephones or portable computers, already comprise in many cases means for datatransfer and/or remote control by way of infrared light.

**[0030]** A rapidly increasing number of systems in the field of information technology and telecommunications adheres to the de-facto standard "Bluetooth" for short-distance radio communications. Therefore it is advantageous if the system according to the present invention comprises means enabling data transfer between said system and electronic devices in or in the proximity of the vehicle, according to this de-facto standard, which is supported by a significant part of the information technology and communications industry.

**[0031]** The data registered by means of the system according to the present invention will often serve to accurately establish for instance the extent of the private use of a company vehicle, the distance traveled with a rented vehicle etc. The financial consequences of this will often be beneficial for the owner, renting or leasing company, but chargeable to the user of the vehicle concerned. Such system will consequently have to be able to resist unwanted tampering or sabotage. With the exception of the aforementioned means for communication by way of infrared light, which should placed at an accesible location in the passenger compartment of the vehicle, it could be advantageous if the remaining parts of the system according to the present invention are placed in the vehicle in a way and at a location that such remaining parts are mechanically fixed to the vehicle and protected against unauthorised access and/or tampering from the passenger compartment, as well as from outside the vehicle.

**[0032]** S.M.S. (Short Message Service)-messages are data-messages with a relatively simple structure that can be exchanged efficiently and at low cost through for instance GSM (Global System for Mobile communication)-networks. Trip data and additional information as registered, processed and stored by the system according to the present invention may therefore be effectively transferred to GSM or other suitable networks outside the vehicle in the form of S.M.S.-messages.

**[0033]** Furthermore, trip data and additional information as registered, processed and stored by the system according to the present invention may be transferred to suitable telecommunications and/or datanetworks outside the vehicle in the form of electronic mail or facsimile messages.

**[0034]** The system according to the present invention will be explained in more detail below, according to the attached drawings and a description of a preferred embodiment. It should be noted however that the described embodiment has been selected exclusively to illustrate application of the system according to the present invention and should not be regarded as limiting such application whatsoever.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0035]** Figure 1 is a schematic diagram of a preferred embodiment of the system according to the present invention.

**[0036]** Figure 2 is a graphical representation of a datastructure for trip data, which can advantageously be used with the system according to the present invention.

**[0037]** Figure 3 is a graphical representation of a preferred datastructure of a S.M.S. (Short Message Service)-message.

**[0038]** Figure 4 is a graphical representation of a preferred datastructure for the header of a S.M.S.-message.

## DESCRIPTION OF PREFERRED EMBODIMENTS

**[0039]** Figure 1 shows a schematic diagram of a preferred embodiment 100 of the system according to the present invention, comprising a central processing unit 101, preferably a microcontroller with RAM-memory (not shown) for storage of the program instructions for the microcontroller and intermediate data storage. The microcontroller is connected to a databus 102 enabling exchange of data with other parts of the system. A wide range of standardised systems may be used for such databus. Said databus 102 connects the microcontroller 101 to a first electronic memory 105 for storage of vehicle specific data, being for instance odometer calibration data and/or vehicle identification data, connects microcontroller 101 to a second electronic memory 106 for storage of trip data and additional information, and connects microcontroller 101 to a so-called "Real-time-clock" (RTC) 107, being an electronic means which provides the current date and time. The electronic memory 106 is organised in such a fashion that when it is full, the oldest trip record stored in said memory will be lost, every time a new trip record enters into the memory. RTC 107 can be adjusted by microcontroller 101 and is equipped with an emergency power supply 108, being for instance a (rechargeable) battery, which secures provision of the current date and time when there is a interruption in the power supply to the system according to the invention. Said electronic memories 105 and 106 are shown separately in figure 1, but could in practice be integrated in one electronic component, together with the microcontroller's RAM-memory. Maintaining a physical separation between said memories could however be preferred, when one would for instance additionally protect the electronic memory 105 for vehicle specific data, against unwanted tampering from the outside because this electronic memory contains data that may disturb the correct functioning of the system according to the invention when the integrity of said data is compromised. Normally, such vehicle specific data will be entered by an authorised party, for instance the manager of the motor pool, when the vehicle is put into operation for the first time. For extra security said data could

be stored in encrypted form in electronic memory 105. Said electronic memories may advantageously be realised in the form of EEPROM's (Electrical Erasable Programmable Read Only Memory). In that case the contents of said electronic memories is not lost when an interruption occurs in the power supply to the system according to the present invention. Microcontroller 101, as well as RTC 107 are being supplied with the necessary clock pulses by an oscillator 103. Said oscillator 103 is preferably a quartz chrystal oscillator. The system according to the present invention preferably receives the necessary electrical power from the vehicle's electrical supply system 200. The system according to the present invention may obtain the necessary electrical power through the ISO (International Standardization Organisation)-standardised connector, which is present in most recent model road vehicles to facilitate installation of a car radio. The system according to the invention furthermore comprises an electrical supply part 104, which converts the electrical supply from the vehicle's electrical system into a form suitable for the electronic components of the system according to the present invention. The electrical supply part 104 may additionally comprise means to conserve electrical energy when the system according to the present invention is used infrequently. To issue an optical and/or acoustical warning to a user of the system according to the present invention, the system may comprise an output means 109. Said output means 109 may consist of, for instance, a display, one ore more light emitting diodes (LED's), a buzzer, etc., or combinations of these elements. Through said output means, information can be presented to a user, with respect to, for instance, the operational status of the system according to the present invention, or a warning when the storage capacity of the electronic memory 106 for storage of trip data is occupied to a certain extent. The system according to the present invention furthermore comprises an input means 110, which preferrably has a simple form, like a three-position switch enabling a user to communicate to the system whether a vehicle trip should be registered as business, private or commuting, but said input means 110 could also be a keyboard. In most recent model road vehicles an electronic pulse signal 300 is generated, that gives a measure for the distance travelled by the vehicle. Such pulse signal may be obtained in most cases through the aforementioned ISO-standardised connector, which is present in most recent model road vehicles to facilitate installation of a car radio. The system according to the present invention furthermore comprises a means 111, enabling detection of operation of the vehicle's ignition switch, and means 112 enabling detection of the open or closed status of the filling opening of the vehicle's fuel tank. Said detection of operation of the vehicles ignition key may be realised by detecting significant changes in the electric voltage on the supply lead of the aforementioned ISO-standardised connector. Means 113 converts the signals delivered by means 111 and 112 into a form that is suitable for further processing of the signals by microcontroller 101. Numerical reference 114 refers to the communications part of the system according to the present invention. This communications part comprises means for transfer of data between the system according to the present invention and electronic devices 400 in the vehicle or in the proximity of the vehicle. An electronic device 400 may be for instance a mobile cellular telephone and/or a portable computer (like a laptop computer, a notebook computer, a palmtop computer or a personal digital assistant). Said means for data transfer may consist of a simple electric cable, but may also consist, for instance, of a transmitter/receiver for infrared light or short-distance radio communications. The system according to the present invention may, through the communications part 114, control said electronic devices 400 in such a fashion that these devices transfer data that is supplied by the system according to the present invention, to telecommunications and/or datanetworks outside the vehicle. In this way trip data and additional information, for instance in the form of S.M.S. (Short Message Service)-message or email messages, can be transferred to for instance a leasing company or a maintenance service by means of a mobile telephone. The data transfer between the communications part 114 of the system according to the present invention and said mobile cellular telephone may be accomplished by way of a cable, or by way of infrared light, for instance adhering to the IrDA (Infrared Data Association) communications standard. In case the system according to the present invention should operate completely autonomous because user interaction, for instance to install a mobile telephone or switch-on a portable computer, is unwanted, the communications part 114 may itself comprise means like for instance a transmission/reception means, to enable direct transfer of data to for instance a network for mobile telecommunications. Through said electronic devices 400 extra information may be added to the trip data stored in electronic memory 106. Such extra information may, for instance comprise information with respect to the business activity to which the trip is to be allocated, information supplied by a GPS (Global Positioning System)-system with respect to the location of the vehicle at the start and the end of a trip, or a voice message recorded by means of the microphone system of a mobile telephone. In addition to this an electronic device 400 may be an infrared remote control enabling entering, readout and correction of the vehicle specific data in electronic memory 105 by an authorised person. As such, the system according to the present invention offers a user a large degree of freedom and flexibility in determining the preferred extent of user interaction and in selecting suitable communications media. By making use of standardised data transfer methods the functionality of the system may easily be extended with for instance the use of GPS-systems, which are nowadays present in an increasing number of vehicles. Furthermore all

parts of the system according to the present invention can be realised with commonly available standard components, and the system utilizes technical means that are quite common in most vehicles nowadays.

**[0040]** Trip data and additional information are preferably stored in the electronic memory 106, according to the datastructure shown in figure 2. In principle the system according to the present invention is continuously operational, however supply part 104 may comprise means to switch off the system partially or completely in case of infrequent use. Detection of specific events, hereinafter referred to as "registration events", however causes the system according to the present invention to return automatically to an operational status enabling registration of such registration event. In it's simplest form a registration event consists of the operation of the vehicle's ignition switch, irrespective of whether the engine is started or stopped, or consists of the opening or closing of the filling opening of the vehicle's fuel tank. Both registration events cause the generation of a trip registration which is stored in electronic memory 106 according to the data structure in figure 2. Every basic trip registration consists of a 20-byte datablock (8 bits per byte). The first two bytes RN of said datablock contain a trip number. Trip numbers are assigned in consecutive order on the occurrence of a registration event, like for instance operation of the ignition switch or the opening of the vehicle's fuel tank. The microcontroller 101 receives the current date and time of the start of the registration event from the real-time-clock 107 and adds these to the trip registration in the form of four bytes DT1. In the three bytes KM1 the odometer reading at the start of the trip is stored. When the system is put into operation for the first time, the current odometer reading is entered into the electronic memory 105 by an authorised person. Based on the calibration data that has been entered into the same memory 105, the pulse signal 300 that is generated during movement of the vehicle, is converted into a measure of the distance travelled by the vehicle and added to said odometer reading. The three bytes KM2 contain the odometer reading at the end of a trip and the four bytes DT2 contain date and time of the end of the trip. Due to the fact that opening of the vehicle's fuel tank is regarded as a registration event and is registered as the start of a new trip, and due to the fact that a vehicle generally does not move during fueling, it may be obvious that the odometer readings at the start and at the end of a fueling session will be equal. The byte RT contains a reference stating the purpose of the trip. For this trip purpose one could distinguish between "business", "private", "commuting" and "fueling". As mentioned earlier, extra information can be added to a trip registration by means of electronic devices in or in the proximity of the vehicle, like mobile cellular telephones, portable computers, GPS-systems etc. The bytes XTR in figure 2 may be used for this purpose. In case the trip registration and additional information can not be stored in 20 bytes, extra 20-byte datablocks may be added to a trip registration, and the first (left side) byte XTR in figure 2 can be used as a counter to indicate the total number of 20-byte datablocks for the current trip registration. Without addition of for instance speech as extra information, it is not to be expected that an average trip registration will contain more than two 20-byte blocks. In case the storage capacity of electronic memory 106 for storage of trip data would be as small as 8 Kilobytes (=8192 bytes), more than 400 trip registrations could be stored in said memory. As described earlier, an optical and/or acoustical warning could be issued to a user of the system according to the present invention through means 109, in case the available storage capacity of the electronic memory 106 is equal to a specified minimum treshold value. In practice however such a situation will only occur if transfer of trip data to a telecommunications or datanetwork outside the vehicle is not possible for an extended period of time because of a defect in for example the communications part 114 of the system according to the present invention, a defect in an electronic device 400 (for instance a mobile telephone), or a defect in the external telecommunications or datanetwork. It is evident that said minimum treshold value for the storage capacity of electronic memory 106 needs to be chosen so as to provide a user of the system according to the present invention with sufficient time after an optical and/or acoustical warning has been issued, to seek technical assistance before the electronic memory 106 is full and trip data is lost.

**[0041]** The communications part 114 of the system according to the present invention could for instance control a mobile telephone in such a way that by means of said mobile telephone, trip data from the electronic memory 106 are periodically transferred in the form of a S.M.S. (Short Message Service)-message to for instance a GSM (Global System for Mobile communication)-network. Figure 3 shows a preferred data structure of an S.M.S.-message for transfer of trip data and extra information by the system according to the present invention. The message contains a 20-byte header and six 20-byte datablocks. This leads to a total message length of 140 bytes. Data-blocks could in this case represent trip registrations produced by the system according to the present invention. Figure 4 shows a preferred data format for the header of a S.M.S.-message when used in combination with the system according to the present invention. The two bytes BN contain the message number and the byte VNS contains the version number of the software used. The two bytes CHK contain a so-called CheckSum, which serves to verify the correct transfer of the message after reception. the six bytes ID contain an identification of the transmitting vehicle. This identification may for instance be the official vehicle registration, coded in ASCII (American Standard Code for Information Interchange). The nine bytes XTR are available for transmission of extra information. In addition to the use of S.M.S.-messages, trip data could be

easily transmitted in the form of email or facsimile messages.

**[0042]** It should be clear to the reader that the invention is in no way limited to the embodiment described above, and that, within the scope of the invention, many different and advantageous embodiments and additions can be envisaged.

## Claims

1. System to be used in wheeled vehicles, for registration, processing and storage of data with respect to trips of the vehicle, comprising means for data transfer between the system according to the present invention and suitable electronic devices in said vehicle or in the proximity of said vehicle, **characterised by** the fact that the system according to the present invention comprises means to control at least one other electronic device in such manner that through said electronic device, trip data as registered, processed and stored by the system according to the present invention, is transferred to one or more telecommunications and/or datanetworks outside the vehicle.

2. System according to claim 1, **characterised by** the fact that the system itself comprises means for transfer of said trip data to one or more telecommunications and/or datanetworks outside the vehicle

3. System according to one of the preceding claims, **characterised by** the fact that trip data as registered, processed and stored by the system according to the present invention, comprises at least a trip number, date and time at the start of a trip, date and time at the end of a trip, the odometer reading at the start and at the end of a trip, and an identification of the purpose of the trip.

4. System according to one of the preceding claims, **characterised by** the fact that extra information can be added to trip data stored in the system according to the present invention, through an electronic device in the vehicle or in the proximity of the vehicle, which is suitable and comprises means for transfer of data between the system according to the present invention and said electronic device.

5. System according to claim 4, **characterised by** the fact that said extra information consists of an electronic representation of the vehicle's location at the start and at the end of a trip.

6. System according to claim 5, **characterised by** the fact that said electronic representation of the vehicle's location is determined by automatic detection of the cell of a cellular network for mobile communications in which the vehicle is located at a certain moment, and by using the known geographical location of this cell as an approximation for the location of said vehicle.

7. System according to claim 4, **characterised by** the fact that said extra information consists of an electronic representation of speech.

8. System according to one of the preceding claims, **characterised by** the fact that said system comprises at least the following parts:

   - a central control and processing unit, for instance a microprocessor, equipped with a suitable software program to provide for the right system functionality.
   - an electronic memory for storage of vehicle specific data like for instance a vehicle identification code and data necessary for calibration of the vehicle's electronic odometer signal.
   - an electronic memory for storage of trip data as registered and processed by the system according to the present invention.
   - electronic means to keep track of the current date and time.
   - means to detect whether the vehicle's ignition switch is being operated.
   - means to register the vehicle's electronic odometer signal.
   - means to connect a cable to establish datacommunication with electronic devices outside the system according to the present invention.
   - output means, suitable for issuing an optical and/or acoustical warning to a user of the system according to the present invention.

9. System according to claim 8, **characterised by** the fact that said detection whether the vehicle's ignition switch is operated, is realised by detecting significant changes in the electric potential on the supply lead of the standardised connector, which is provided in most recent model road vehicles to facilitate installation of for instance a car radio.

10. System according to claim 8, **characterised by** the fact that said electronic odometer signal is obtained by the system according to the present invention, through the standardised connector, which is provided in most recent model road vehicles to facilitate installation of for instance a car radio.

11. System according to claim 8, **characterised by** the fact that said output means for issuing an optical and/or acoustical warning to the user of the system according to the present invention, issues said warning when the available memory capacity for storing trip data has decreased below a specified

treshold value.

12. System according to claim 8, **characterised by** the fact that the system periodically derives data with respect to the distance travelled by the vehicle per unit time, from said electronic odometer signal, and stores said data in an electronic memory in the system according to the present invention.

13. System according to claim 12, **characterised by** the fact that said data with respect to the distance travelled by the vehicle per unit time are stored in said electronic memory in such manner, and that said electronic memory has such capacity, that a databuffer is created, which contains at all time a certain amount of the most recently registered data, equal to the storage capacity of said electronic memory.

14. System according to claim 8, **characterised by** the fact that at least the contents of said electronic memory for storage of vehicle specific data is secured by means of encryption in such manner that said data can only be entered, read-out and altered by an authorised person.

15. System according to one of the preceding claims, **characterised by** the fact that the system comprises an input means, which provides a possibility to a user of the system according to the present invention, to indicate whether the system should register the vehicle trip as business, private or commuting.

16. System according to one of the preceding claims, **characterised by** the fact that the system comprises means to detect whether the filling opening of the vehicle's fuel tank is in an open or closed state.

17. System according to one of the preceding claims, **characterised by** the fact that the system comprises means for data transfer by way of infrared light between the system according to the present invention and electronic devices in the vehicle or in the proximity of the vehicle.

18. System according to claim 17, **characterised by** the fact that said means for data transfer by way of infrared light, operate in conformity with the so-called "IrDA" (Infrared Data Association) communications standard.

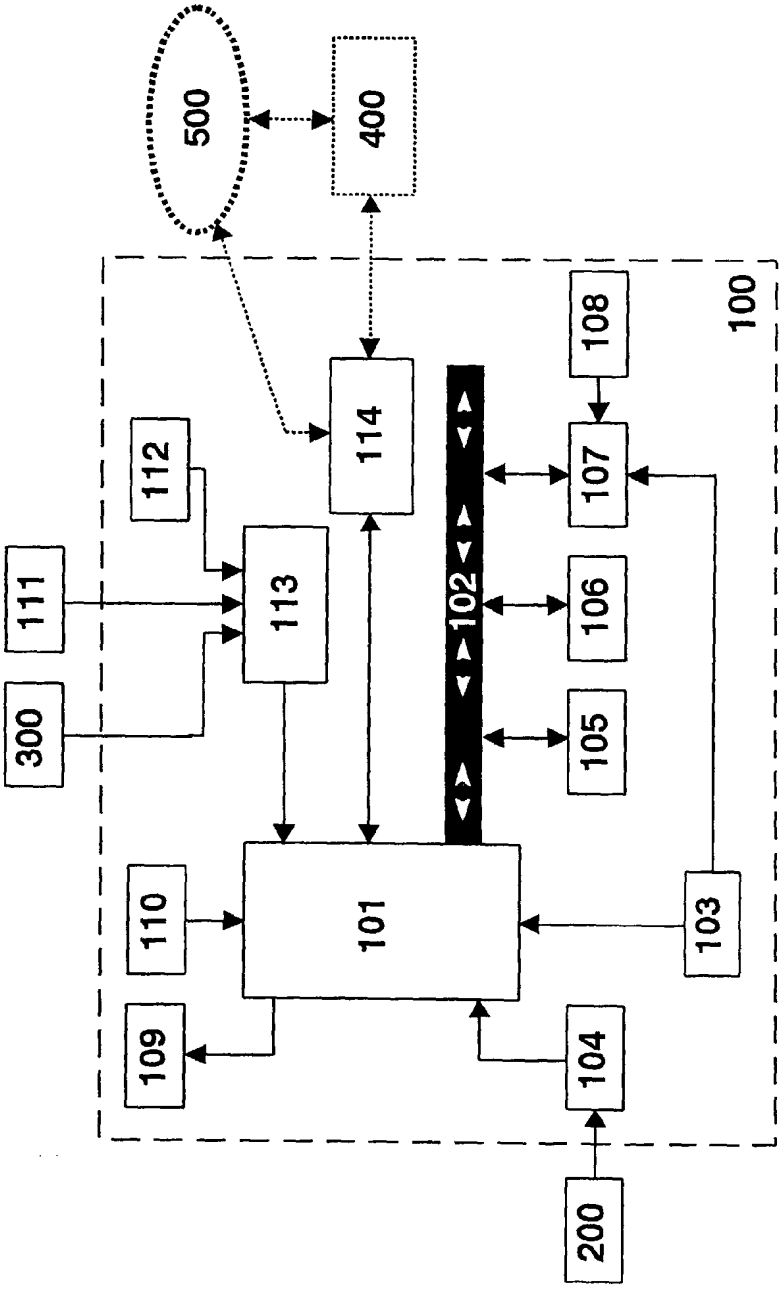
19. System according to one of the preceding claims, **characterised by** the fact that the system comprises such means that data transfer between the system according to the present invention and electronic devices in the vehicle or in the proximity of the vehicle, is accomplished in conformity with the so-called "Bluetooth" de-facto standard for short-distance radio communications.

20. System according to one of the preceding claims, **characterised by** the fact that parts of the system are placed in the vehicle in such manner and at such location(s) that said parts are mechanically attached to the vehicle and protected against unauthorised access and/or tampering, from within the vehicle's passenger compartment, as well as from outside the vehicle.

21. System according to one of the preceding claims, **characterised by** the fact that trip data and extra information as registered, processed and stored by the system according to the present invention, is transferred to telecommunications and/or datanetworks outside the vehicle, in the form of S.M.S. (Short Message Service)-messages.

22. System according to one of the preceding claims, **characterised by** the fact that trip data and extra information as registered, processed and stored by the system according to the present invention, is transferred to telecommunications and/or datanetworks outside the vehicle, in the form of email messages.

23. System according to one of the preceding claims, **characterised by** the fact that trip data and extra information as registered, processed and stored by the system according to the present invention, is transferred to telecommunications and/or datanetworks outside the vehicle, in the form of facsimile messages.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109
104
200

Fig. 1

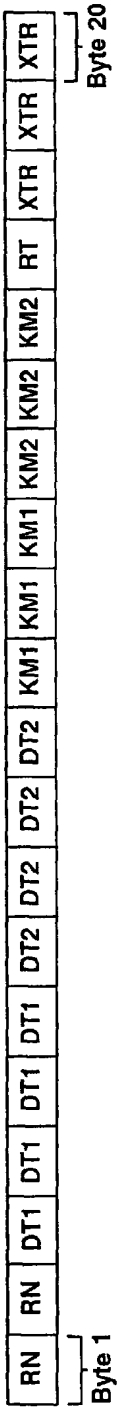


Fig. 2

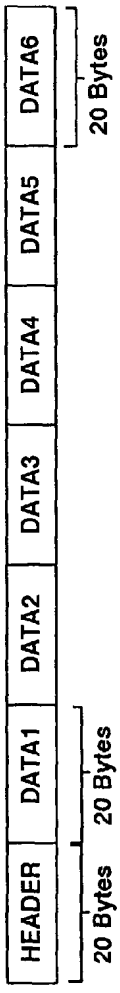


Fig. 3

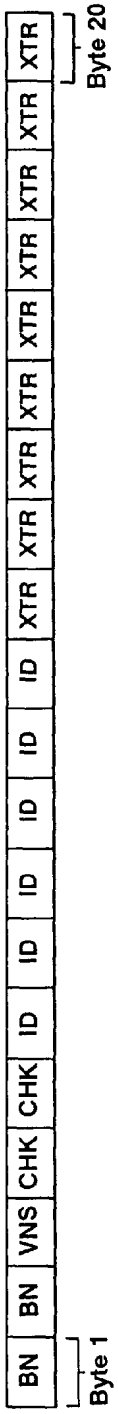


Fig. 4